Chapter 11: Gene Action

Modeling DNA

Process and Procedures

Date

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Page #

1. Create a color key.

2. What is a nucleotide?

3. What are the three building blocks of a nucleotide?

4. How many different nitrogen bases are found in DNA?

5. How do the bases pair up?

Chapter 11: Gene Action

Modeling DNA

DNA Structure and Replication

Date

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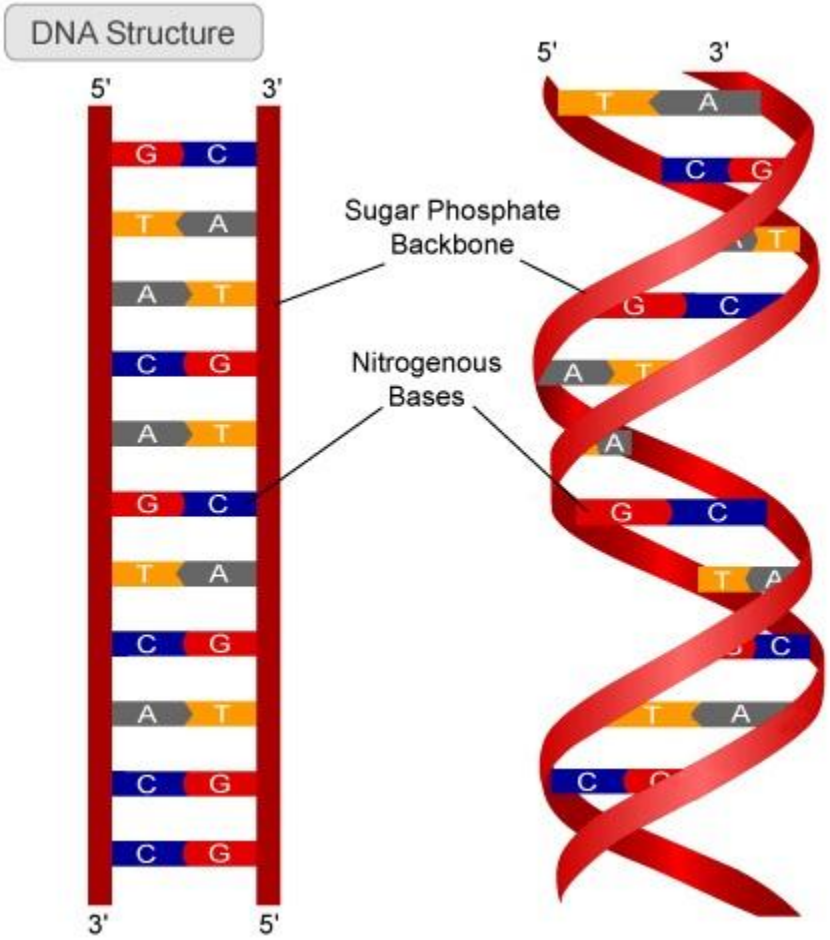
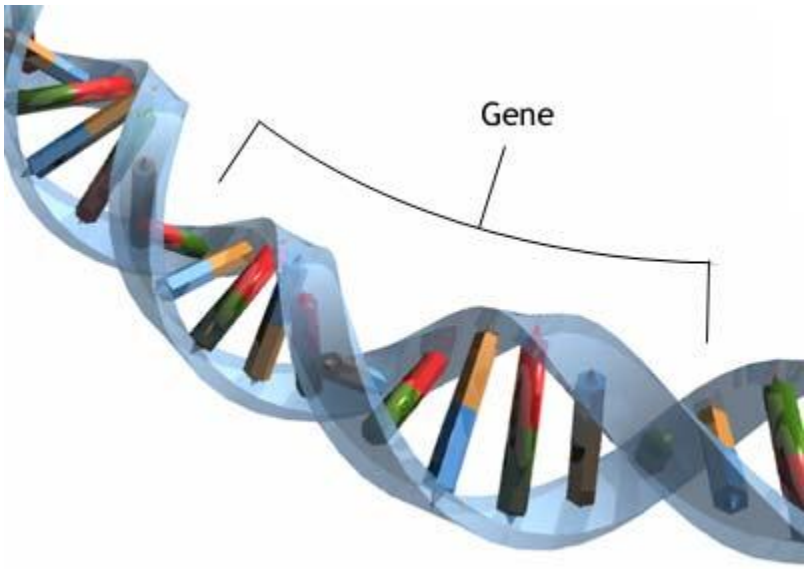
http://www.brainpop.com/science/cellularlifeandgenetics/dna/

DNA	a molecule responsible for transferring genetic information from parents to offspring Is required for building, maintenance and regulation of all living organisms' cells
Structure of DNA	shape of a twisted ladder The sides, or "backbone" of the ladder is made of sugar-phosphate molecules The rungs/steps of the ladder are made up of nitrogen bases
Nitrogen bases	•adenine (A) •cytosine (C) •guanine (G) •thymine (T)

Complementary base pairing	the specific bonding pattern between nitrogen bases adenine—thymine cytosine—guanine

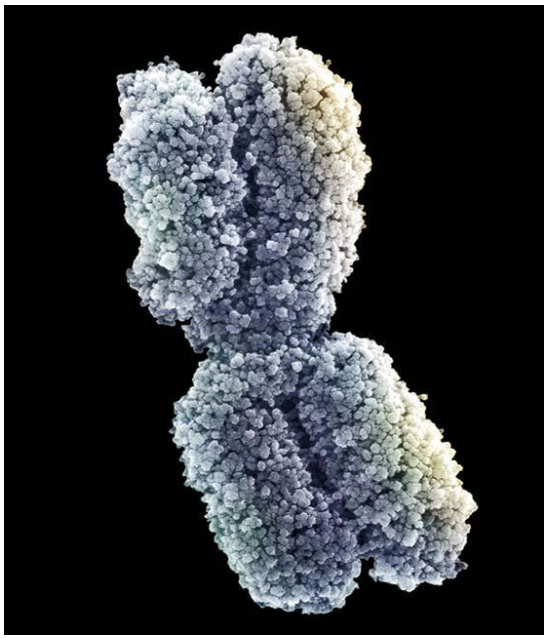


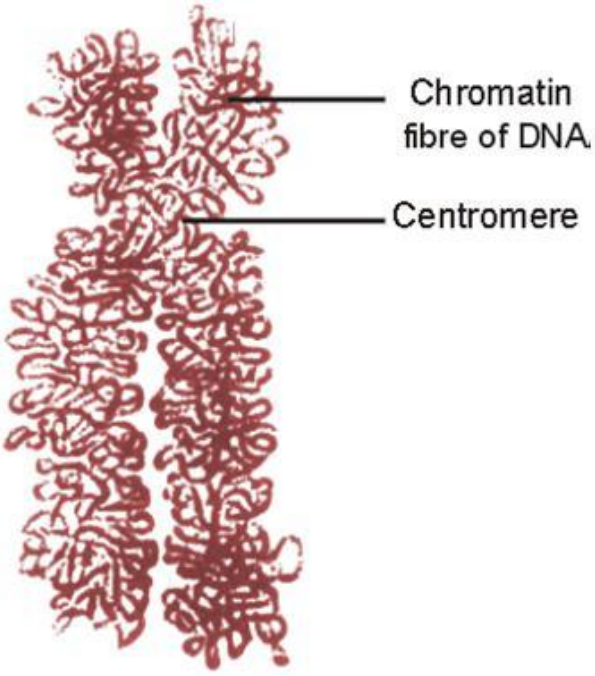
Gene	a section of DNA that controls physical characteristics (eye color, height, etc.)



Chromosome structure in the nucleus that contains DNA

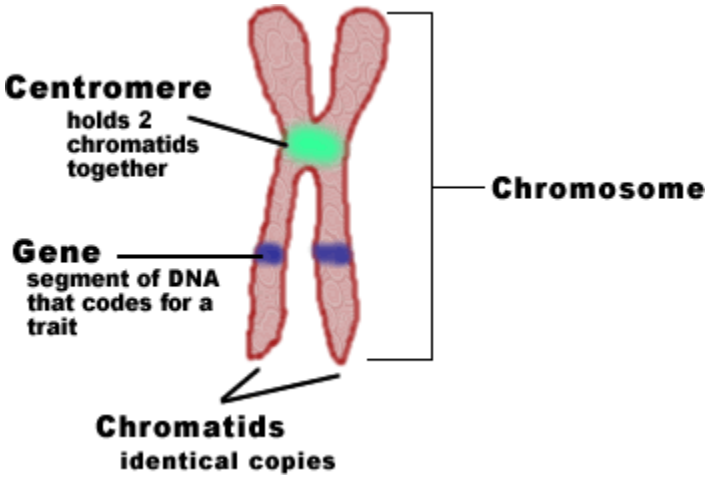
It is made of a tightly coiled material called *chromatin*

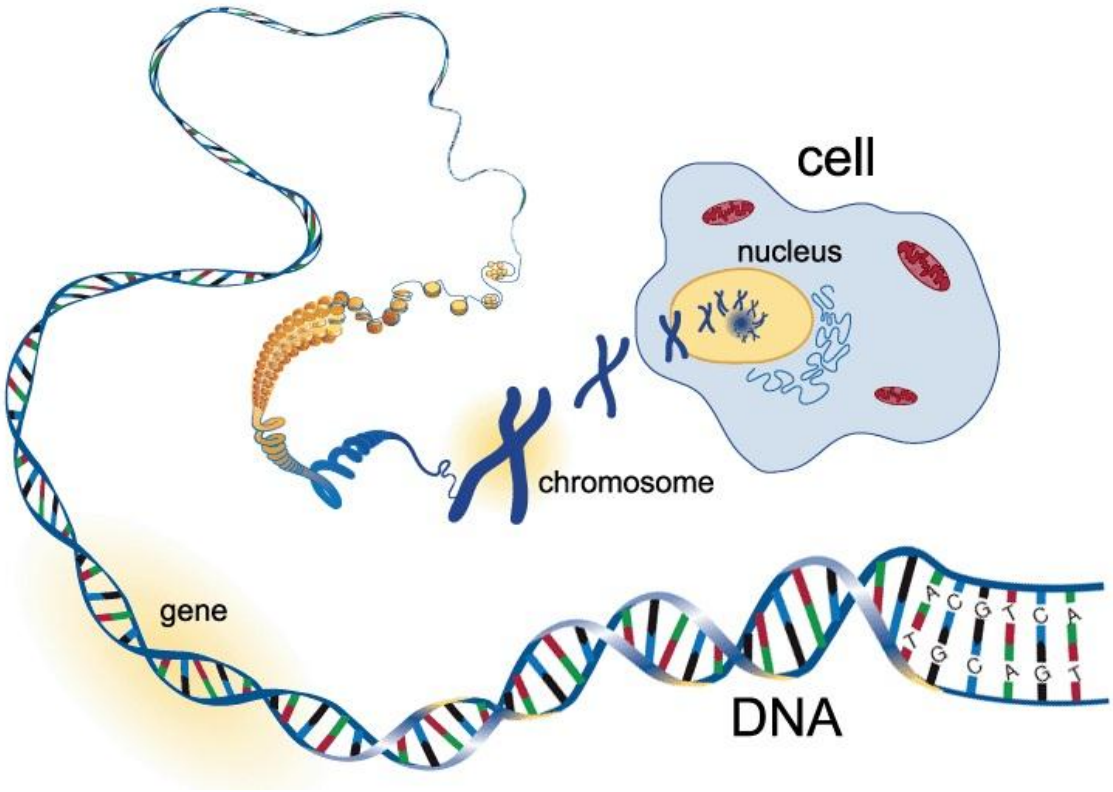




Chromatid each half of the chromosome

Centromere holds the chromatids together





http://www.sinauer.com/cooper5e/animation0501.html

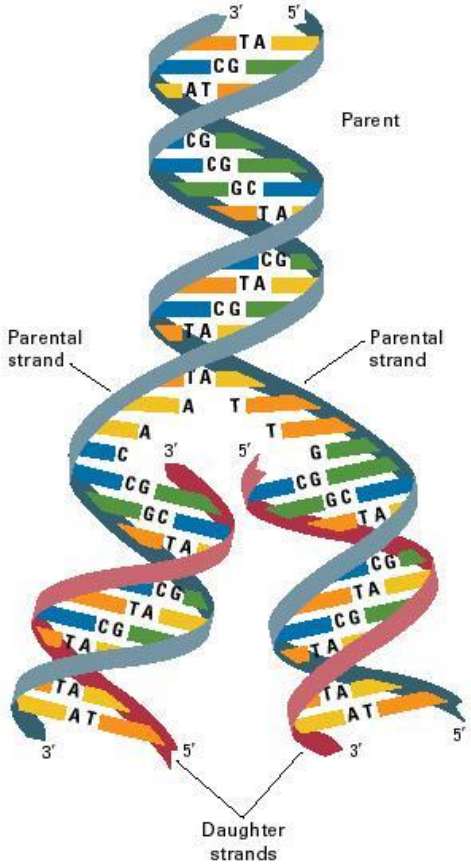
Chromosomes	come in pairs One from male parent, one from female parent Humans have 46 chromosomes (23 pairs)
Number of chromosomes	•constant for each cell in the body (except for gametes, which only have half sets) •constant throughout the life of an organism (cannot gain or lose chromosomes) •constant for all members of a species
Copying DNA	a cell must copy its DNA before dividing and making more cells (daughter cells)
Replication	the process of making a copy of a cell's DNA An enzyme called helicase separates and unwinds the double-stranded DNA molecule

Another enzyme called DNA polymerase moves along the broken strands and adds complimentary nitrogen bases

2 DNA molecules

each molecule contains one old strand and one new complementary strand

They are exact copies of the original DNA molecule



http://www.wwnorton.com/college/biology/discoverbio4/animations/main.aspx?chno=ch12a04

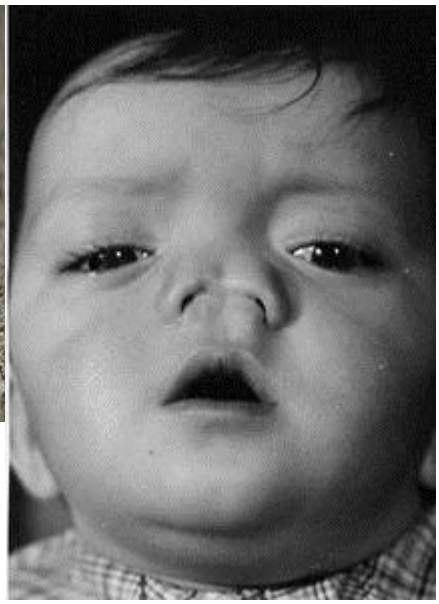
http://www.stolaf.edu/people/giannini/flashanimat/molgenetics/dna-rna2.swf

http://highered.mcgraw-hill.com/sites/0072507470/student_view0/chapter3/animation__dna_replication__quiz_1_.html

Mutation — a permanent change in DNA that occurs during replication

Mutations in body cells can be helpful, harmful or have no effect

Mutations in gametes are passed down to the offspring



http://www.brainpop.com/science/cellularlifeandgenetics/geneticmutations/

Protein synthesis — making proteins

Proteins are made by cells for different jobs

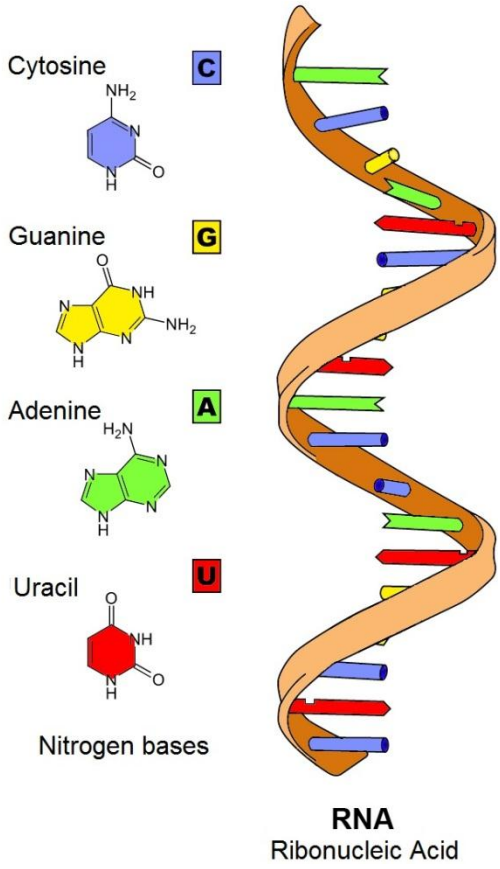
To make proteins, a cell has to follow a set of instructions from DNA

RNA a single-stranded nucleic acid molecule

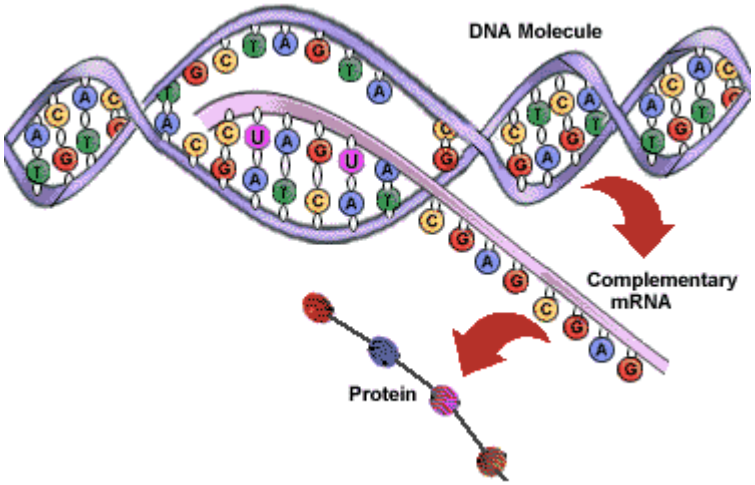
It is needed to deliver and interpret the instructions for making proteins

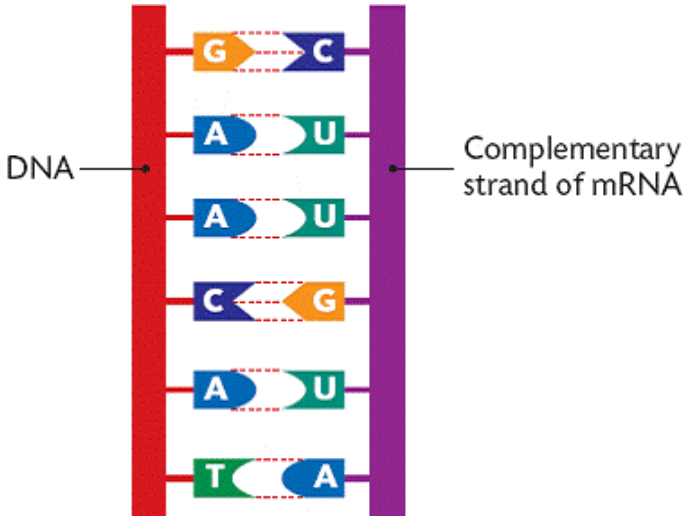
RNA differs from DNA

- single strand
- sugar is ribose
- uracil replaces thymine



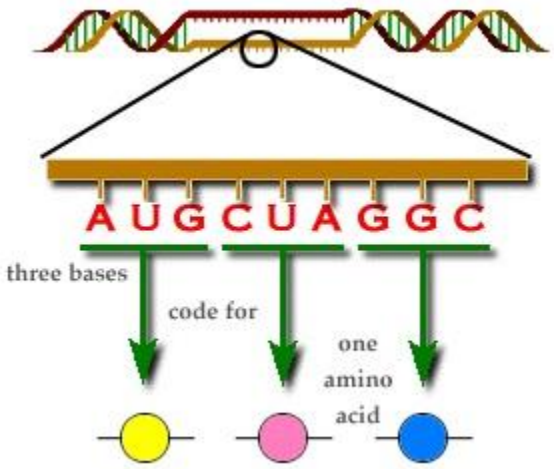
3 types	1. messenger RNA (mRNA) 2. transfer RNA (tRNA) 3. ribosomal RNA (rRNA)
Transcription	the process of making mRNA from a strand of DNA





http://www.johnkyrk.com/DNAtranscription.html

Messenger RNA	carries the instructions for making a protein from the DNA in the nucleus to the ribosomes mRNA attaches to the ribosome
Codon	a piece of an mRNA molecule that contains three sequential nitrogen bases

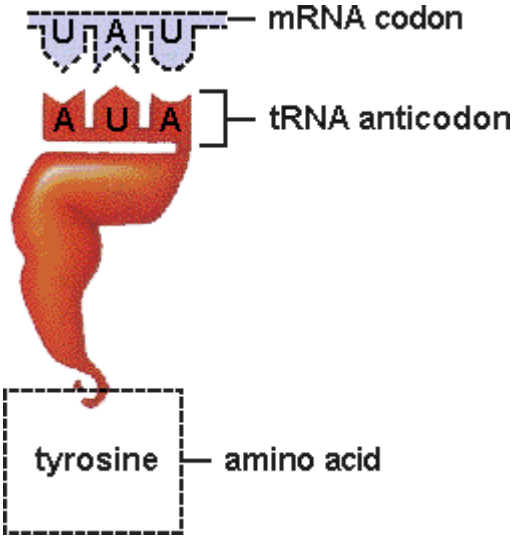


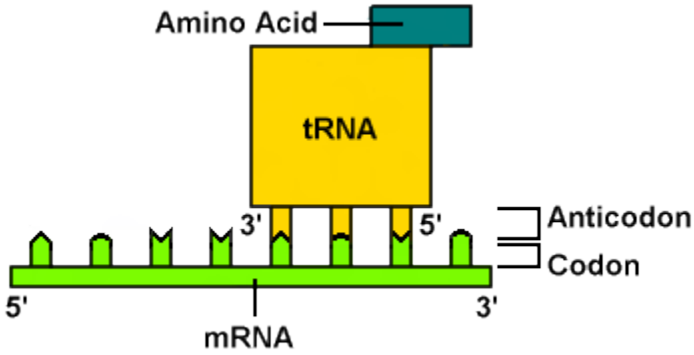
Each codon corresponds to a specific amino acid

1st base	2nd base								3rd base
	U		C		A		G		
U	UUU	Phenylalanine (F)	UCU	Serine (S)	UAU	Tyrosine (Y)	UGU	Cysteine (C)	U
	UUC		UCC		UAC		UGC		C
	UUA	Leucine (L)	UCA		UAA	stop codon	UGA	stop codon	A
	UUG		UCG		UAG		UGG	Tryptophan (W)	G
C	CUU		CCU	Proline (P)	CAU	Histidine (H)	CGU	Arginine (R)	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	Glutamine (Q)	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	Isoleucine (I)	ACU	Threonine (T)	AAU	Asparagine (N)	AGU	Serine (S)	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	Lysine (K)	AGA	Arginine (R)	A
	AUG	Methionine (M) & start codon	ACG		AAG		AGG		G
G	GUU	Valine (V)	GCU	Alanine (A)	GAU	Aspartic Acid (D)	GGU	Glycine (G)	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	Glutamic Acid (E)	GGA		A
	GUG		GCG		GAG		GGG		G

Anticodon — a section of tRNA made of three bases that are complementary to the mRNA codon

The tRNA anti codon pairs with its matching mRNA codon





Proteins are made of chains of amino acids

Translation

tRNA translates the instructions for making a protein from the mRNA

Modeling DNA

Cell Division

Date

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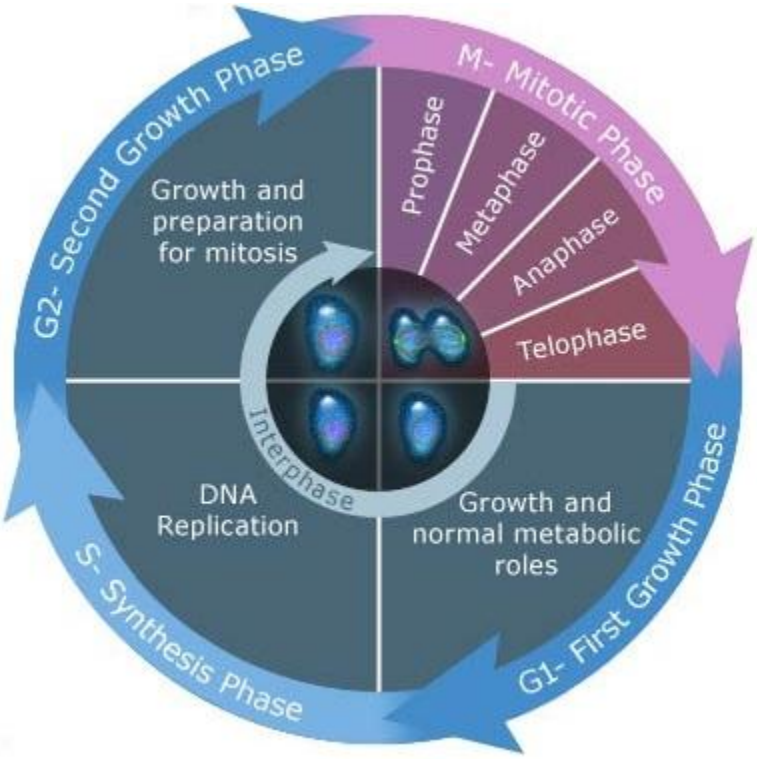
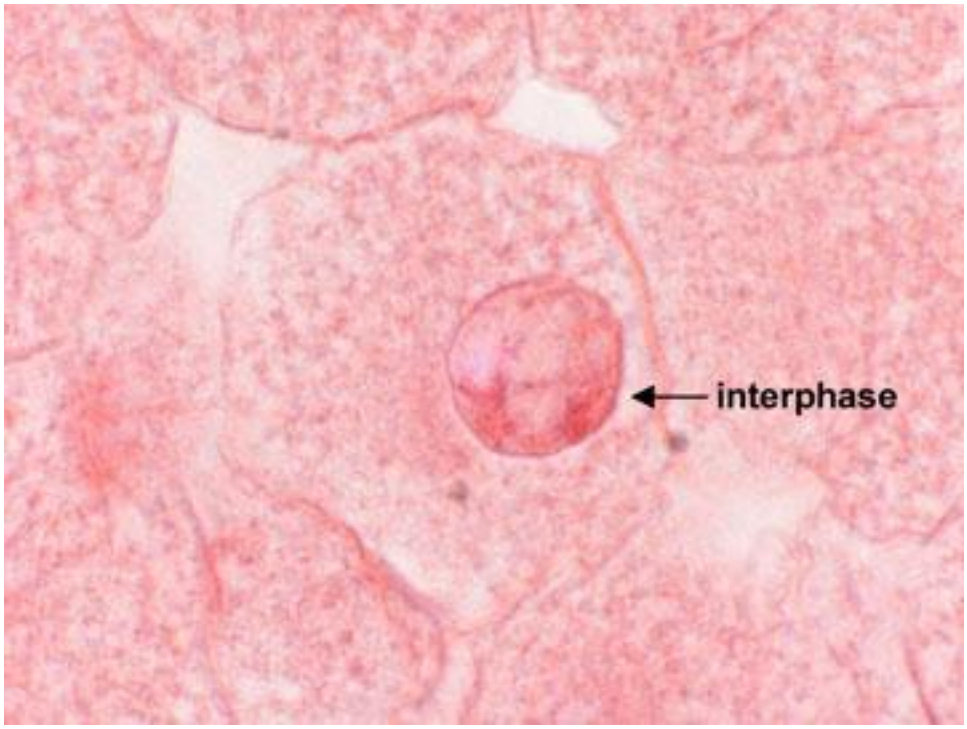
http://www.brainpop.com/science/cellularlifeandgenetics/mitosis/

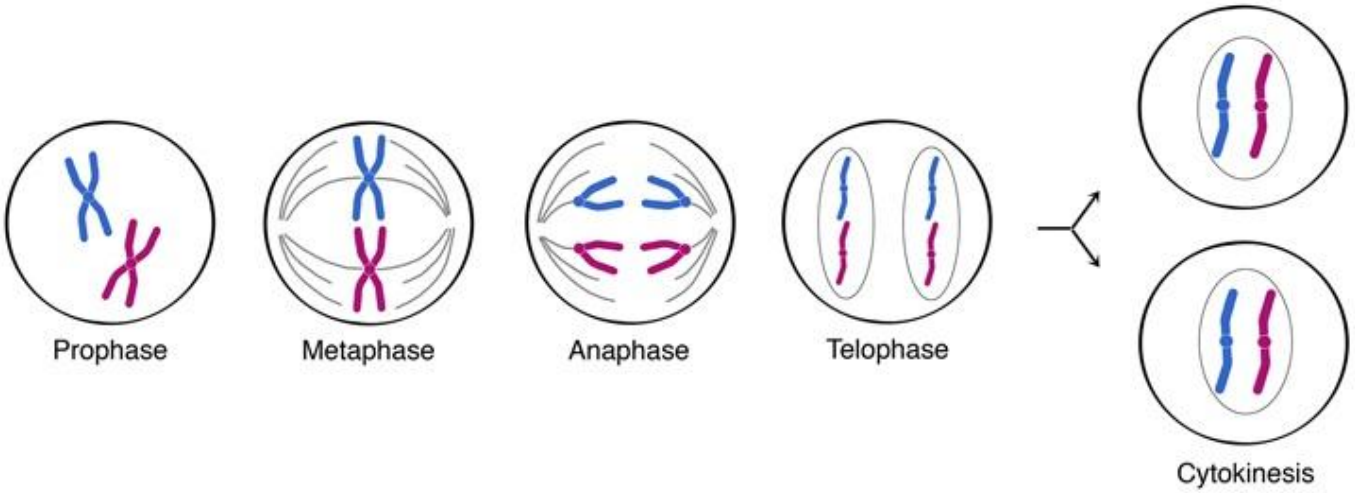
Cell cycle a repeating set of events that makes up the life of a cell



Interphase stage of the cell cycle in which a cell grows and makes copies of its DNA (G_1, G_2, S)



Growth and repair	why cells divide and make more cells
Mitosis	the division of a cell's nucleus



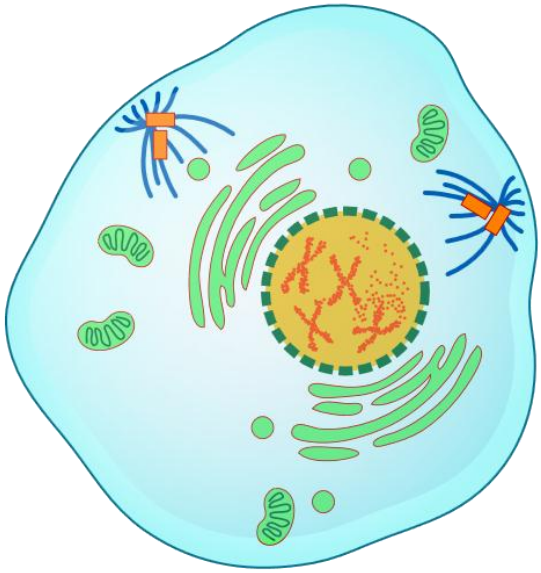
Why mitosis?	to create more cells for growth and repair

Phases of mitosis

1. prophase
2. metaphase
3. anaphase
4. telophase

Prophase

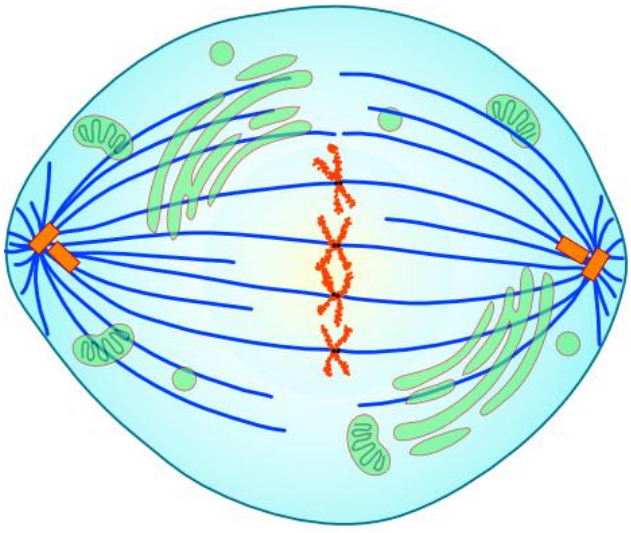
the chromosomes group tightly together and the nuclear membrane disappears



http://www.phschool.com/science/biology_place/biocoach/mitosisisg/prophase.html

Metaphase

the copied chromosomes line up in the center of the cell



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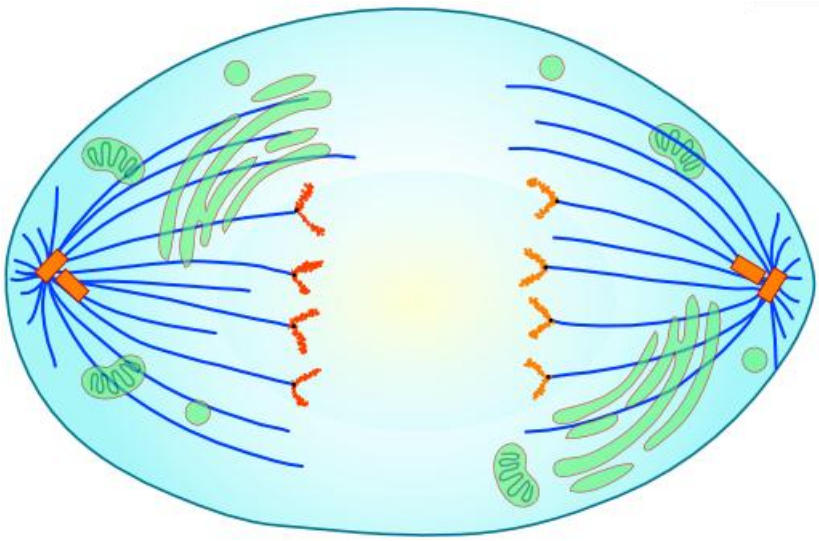
Anaphase the copied chromosomes separate and move to opposite ends of the cell



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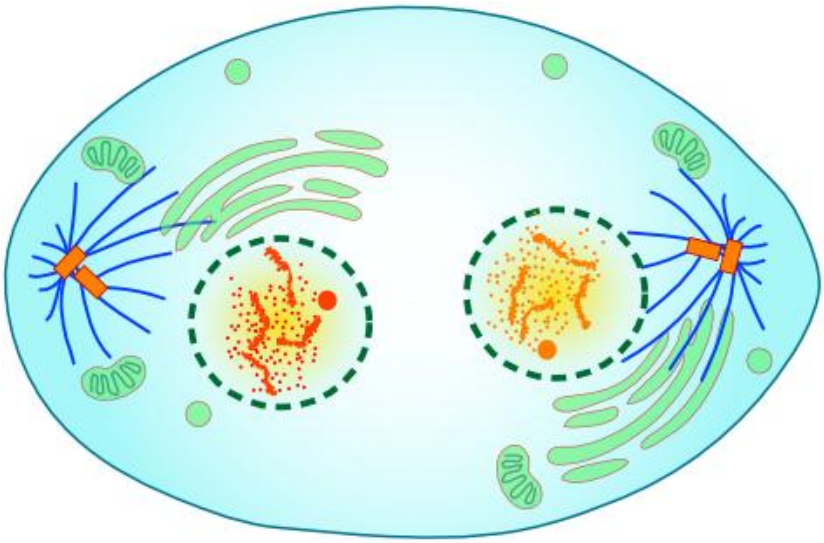
Telophase a nuclear membrane forms around each set of daughter chromosomes



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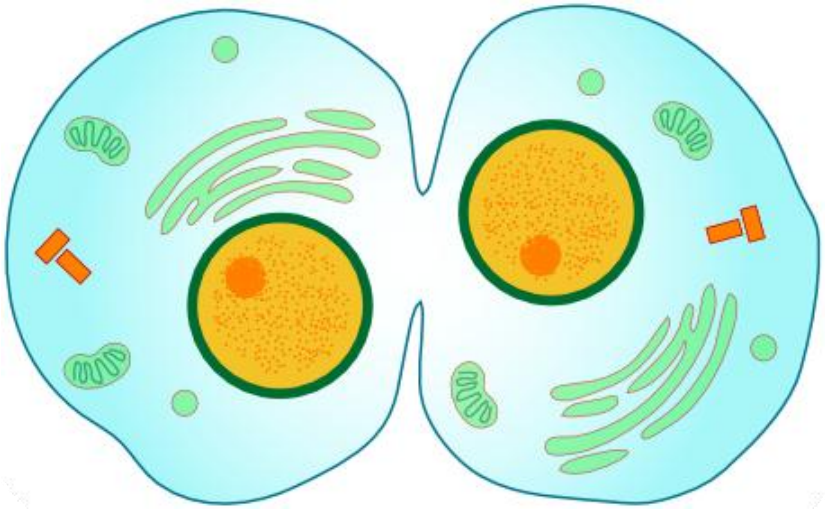
http://www.cellsalive.com/mitosis.htm

http://www.biology.arizona.edu/cell_bio/tutorials/cell_cycle/cells3.html

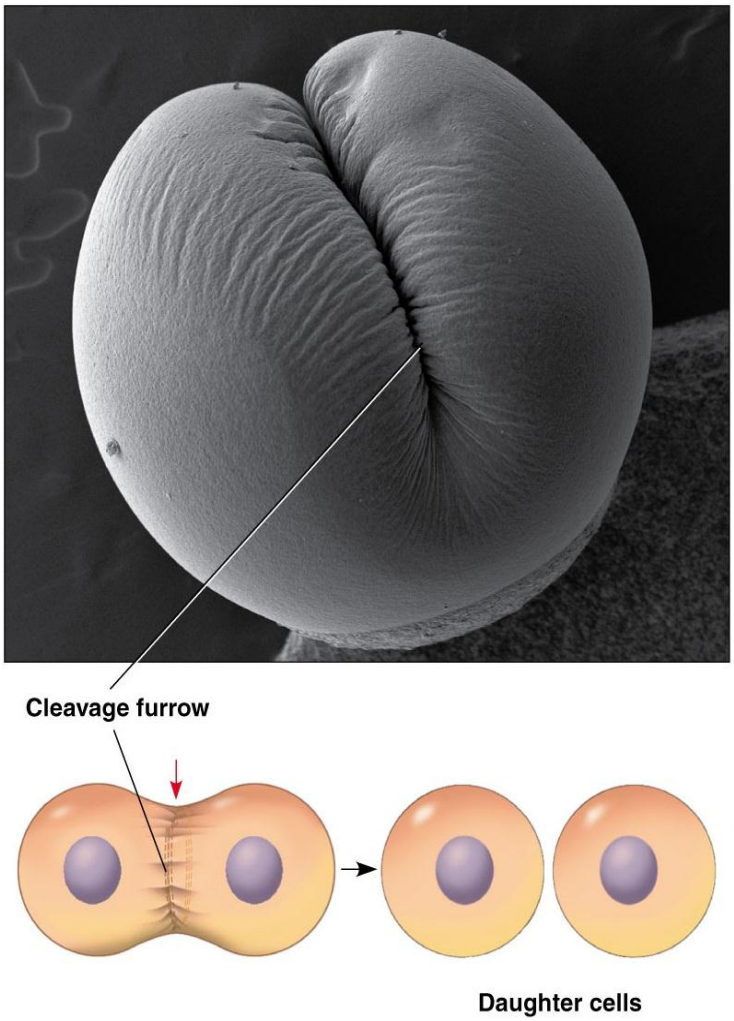
http://www.johnkyrk.com/mitosis.html

http://www.sumanasinc.com/webcontent/animations/content/mitosis.html\

Cytokinesis the division of the cytoplasm of a cell



It occurs when the cell membrane pinches inward

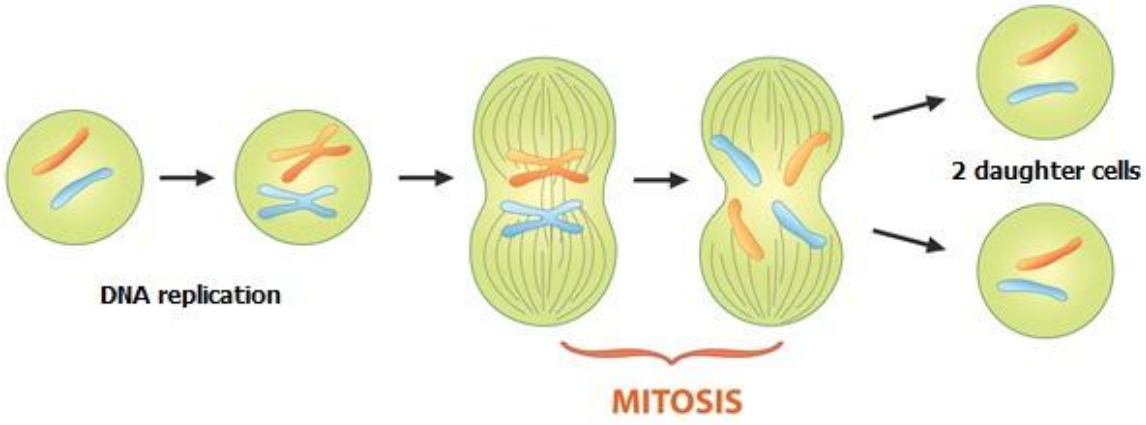


http://www.phschool.com/science/biology_place/biocoach/mitosisisg/mitoan.html

http://highered.mcgraw-hill.com/sites/9834092339/student_view0/chapter10/animation_-_cytokinesis.html

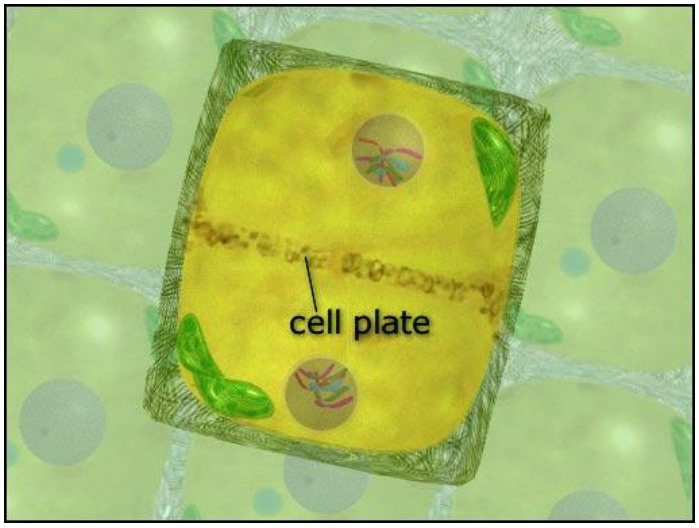
http://www.sciencesource2.ca/resources/SS_active_art/active_art/SEinteractive_gr10_ch01_pg30/index.html

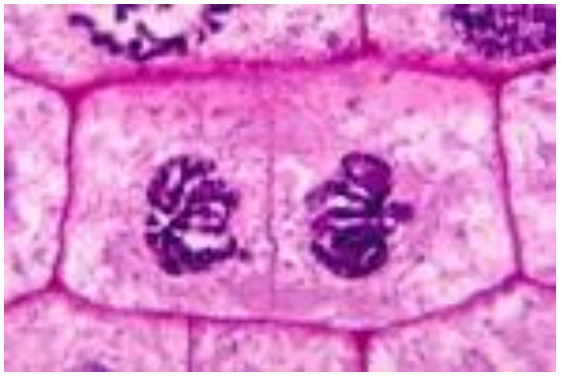
Daughter cells — the two identical cells formed by mitosis



Cytokinesis in plants — a cell plate separates the cell into two cells

Each daughter cell receives an identical copy of the original cell's chromosomes





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